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WEATHER CHANCES

REVEALED BY

A. J. DE VOE

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A. J. DE VOE
as he looks to-day.

WEATHER CHANGES

Revealed by

A. J. DE VOE

The well-known Meteorologist of Hackensack, N. J.,
after more than sixty years of
careful observations.

WEATHER LORE IN A NUTSHELL

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FOREWORD

The education of the race varies to meet the needs of individuals. For example a working knowledge of meteorology was an essential part of the training of the Indian. Their experienced hunters knew from constant study the meaning of the changing features of the sky. Most farmers and fishermen are keen observers of nature and become quite accurate in forecasting weather conditions. Boys and girls brought up in our large cities know little or nothing about the signs that point to weather changes. Many a life is lost on our rivers and lakes during the summer vacation time because people venture out in boats and canoes in the face of what experienced observers know as an approaching storm. The campaign for safety which is now being so vigorously pushed might well urge the study of weather forecasting as a means of conserving human life.

Professor DeVoe is recognized as one of the foremost experts in this country in forecasting weather changes. This has been his special study since his early boyhood. In this little book he gives in an interesting manner much useful information interwoven with his personal experiences over a period of seventy years. He writes as he speaks with a deep conviction of his knowledge of the laws that control the coming and passing of great storms. In this little book Professor DeVoe does not tell you all he knows. What weather prophet ever does. It is hoped that the author may interest many in a topic concerning which few can speak with authority to such an extent that they will be stimulated to use their powers of observation and thus get from reading the book of nature what she trys to tell in

the changing cloud and the shifting wind. The rocks beneath our feet tell the story of our past; the clouds over our heads forecast the story of the future. It will do us good to know more about the various manifestations of nature.

William Alexander Smith, A.M.

BY WAY OF PREFACE

An old adage runs to this effect: "Poets are born not made." In a larger sense that may be applied to the author of this work on the weather; he is a born meteorologist. From his earliest years he has had a passion for the study of clouds and storms. With increasing maturity that early interest crystalized into a life study of meteorolgy. Like many another heroic soul he found the path of progress had its stones and briars, its valleys of humiliation as well as its mounts of vision. Persevering amid all discouragements he found dawning upon him knowledge of great natural forces and laws that enabled him to venture predictions as to what the weather would prove to be for some days ahead. With added observation, experience and widening knowledge he felt justified in going a step further and forecasting the weather for a year or more in advance. In taking such a long stride ahead of his professional associates it was to be expected that he would meet with opposition and, in some quarters, ridicule, but these were alike unavailing in stopping his pursuit of his chosen vocation or the utterances of his opinions and his prophecies as to what atmospheric changes might be expected in the coming year. Fortunately he has lived long enough to see these "long distance" forecasts justified by the seasons as the earth wheeled in its annual orbit about the sun, and also to see those who formerly sneered at those forecasts transformed into those who praised their general accuracy. That change of attitude has been due very largely to the fact that many who have kept careful record of his predictions and their fulfillment have testified that his major forecasts for

large areas of the country have been proven to be in the main correct, and the minor forecasts for local atmospheric conditions have had an average of 80 per cent. of fulfillment.

That surely is a very satisfactory showing for so fallible a being as man, and such unstable material as winds and clouds and atmospheric changes upon which to work. Doubtless with the added resources and broader opportunities for investigation that are now at his command Prof. De Voe will bring that percentage nearer the perfect mark. That the general public may share with him in the benefits to be derived from his discoveries in the realm of natural laws and physical forces, and co-operate with him in the wider appreciation of his methods, he has given this book to all the people, and especially to those who are interested in the advancement of our knowledge of the phenomena that so largely affect us for good or ill in all our enterprises.

SOME EARLY RECOLLECTIONS AND LATER COMMENTS

When I was a small boy I took great pleasure in watching the clouds, especially those developed in connection with thunder showers.

The first thunderstorm I can remember occurred in 1855, and the peculiar circumstances around it impressed it on my mind so that I never forgot it.

On that day there was going to be the first steamboat excursion that ever went up the Hackensack River. The Old Continental Military Company had an excursion from Hackensack to Newark, where they spent the day. They left Hackensack for Newark about 8 o'clock in the morning, from Huyler's Dock, and sailed down the river.

We lived at that time in Ridgefield Park. I was so small that I had to stand on the railing of the

fence in order to see over the top of the pickets. As I looked down toward the river I noticed a light hazy bank of clouds and I said, "If that bank of clouds comes up, there is going to be a thunder shower this afternoon."

The excursion passed down the river with flying colors. The band was playing, the militia and the ladies dancing. They spent the day at Newark and then started on the return trip to Hackensack, and reaching the turnpike bridge about 6 o'clock in the evening, and the thunder shower arrived at the same time. That was a great disappointment to us boys. We were all out watching that steam boat coming up the river but the storm was so severe that we all had to seek shelter within adjacent buildings.

From that time up to the present I have always taken a very great interest in the formation of thunder storms.

There is one thing connected with the common idea of thunder storms that I am not able to fully understand. A great many people teach their children, that thunder is God's voice and I was taught that when I was a boy. Who taught me I do not know, but it was my impression, and also that of all the rest of the boys, that the thunder was God's voice.

I suppose that good people have that idea from the fact, that when the Lord came down on Mount Sinnai to talk with Moses, there was great thunder and lightning so that the mountain shook and Moses said, "I feared and trembled exceedingly."

If thunder was sufficient to cause such a faithful man as Moses to tremble, it is not to be wondered at, that people generally have the dread of thunder; but we should always teach the truth.

Thunder is not God's voice; but it is the result of the operation of natural law. When a dense cloud is formed, the moisture in that cloud is charged

with electricity, but when the moisture in that cloud is condensed into water, it is then separated from the associated electrical current, consequently whenever rain falls in large drops or when hail is formed, no matter how cold the temperature may be, there will be thunder and lightning, even in the midst of winter. This result is due to the fact that the electricity in the cloud looses its equilibrium and is separated from the moisture in the clouds so rapidly that it is unequally distributed and then escapes to our earth.

If there was no explosion, we should simply hear a rushing hissing sound, as we do when we send up a sky rocket. That is all the noise there would be, but we hear very heavy thunder, and the heavier the electrical charge is the heavier the thunder will be.

I have watched thunder storms very carefully and gathered all the information I could, especially regarding instances where electrical balls of fire have passed through houses. From my point of view, there appears to be a collection of chemical substances contained in the heavy clouds and those chemical substances descend sometimes from cloud to cloud, at other times, they descend directly to our earth. When the lightning flashes across the face of the cloud, I call that sheet lightning, but when it darts from the cloud to our earth, it may be called chain lightning.

In every flash of lightning there are explosive chemicals. These are sometimes found and are composed of chemical substances, so hard that no file can touch them, and whenever the chemical substances come in contact with any substance, they explode. At times the electrical charge is not sufficient to carry the bolt to the earth, then it explodes just beneath the clouds.

It is the explosion of those chemical substances which causes the noise which we call thunder.

There are hundreds of instances where balls of fire have passed through houses, going in one window and coming out of another and without the slightest sound.

Sailors at sea have seen balls of fire pass through the rigging of their ships and when they exploded they sounded like half a dozen cannons.

In this connection I wish to refer to the foreclosing instances of the effects spoken of.

The annals of a French academy of science tell of a tailor's adventure with a thunder-bolt. He lived in a house provided with two chimneys—one for a fire place and the other for a stove, the latter not in use. During the thunder storm a tremendous report was heard, and everybody thought that the house had been struck by lightning. Instantly a blue flaming ball dropped into the fireplace and rolled out into the room, the ball of fire playing about his feet. Suddenly it rose above his head and moved off toward the stovepipe hole in the ceiling, which had a piece of paper pasted over it. The ball moved straight through the paper and up the chimney. When near the top, it exploded and tore the chimney into a thousand fragments. The sight of the debris left by the explosion showed the family what would have been the consequences had it exploded while on its gyrating passage through the room.

Scientists tell us that thunder can only be heard 30 miles away, but I distinctly heard thunder 60 miles distant. It occurred in August in the year 1903. It was on a Sunday afternoon. I was sitting out in my front yard, I heard a rumbling sound but I could see no cloud, but about 10 minutes later became assured it was thunder, but it was at least 50 miles distant. In order to be certain about the correct distance, I wrote on Monday to the postmasters at Strasburgh, Sparta, and the Delaware Water Gap.

The three postmasters wrote me very interesting letters, but the one in Strasburgh said, "There was no thunder storm here Sunday afternoon but it thundered very heavily, but a few miles north of here, there was a very heavy thunder storm, and hail also that destroyed about everything."

This storm only covered a space of 5 miles wide and 20 miles long, and justified my opinion that there was no other storm which I could have heard but that one; the distance was 61 miles on a straight line from Hackensack.

The first that my people believed that I could see further than ordinary occurred in the summer of 1858, I was then a boy just in my teens.

Wm. A. Allen, the largest kindling wood dealer in the U. S., was my first cousin, and he had his factory in Baltimore, Maryland. His wife boarded with us during the summer. It was on a beautiful clear Friday, with a brisk north-west wind blowing in the afternoon.

I noticed a hazy bank of clouds along the south western horizon extending from the northwest towards the southeast and settling southward. I knew from the formation of those clouds that there was a thunderstorm in progress. I knew nothing then about trigonometry and how to measure distances, but from the shape of those clouds I knew that they were more than one hundred miles distant. So I went into the house and told my cousin, Mrs. Allen, that there was a thunderstorm in progress down in Baltimore, Maryland. She wanted to know how I knew it, and I told her, "That I could see it."

She replied, "When William comes home tomorrow we shall see."

When Wiliam came home that Saturday evening, I hailed him first with the inquiry: "Did you have a thunderstorm yesterday afternoon?"

He said, "Yes, what do you know about it?" Then I went to work and described it to him, how it appeared to me here, and how it probably was there, viz., that they had a heavy thunderstorm in Baltimore that afternoon; that the wind before the storm was blowing from the south; that when the storm arrived it shifted to the northwest and cleared up cooler that night. All of which description harmonized with the facts in the case.

My people regarded it as a joke, that I could see a thunderstorm 175 miles away as I did at that time.

SOME EXPERIENCES WITH SCIENTIFIC MEN

A few years after the Baltimore storm just described, I called at the office of the Weather Bureau in New York City. Dr. Penrod was in charge, and I asked him, "How far he could see a thunderstorm approaching." I was very much surprised to hear him say, that under favorable conditions, you could see a thunderstorm twenty miles away. I did not tell him I could see a storm 100 miles away, for I knew he would laugh at me. I asked him, "How far he could see a usual storm approaching," and he said, "Possibly fifty miles."

I returned home from my visit at the office of Dr. Penrod questioning seriously whether I was a fool or he was, and resolved I was going to determine by further effort which one of us was.

I said nothing, but watched the clouds closely and went down to the city again about two weeks later. Then I said to Dr. Penrod, "I would like to try an experiment, I'll keep tabs on the weather as it occurs in Albany, N. Y., and in Philadelphia, Penn., and I will come down and we will compare notes."

I returned and watched the weather very closely, and took down notes as to the changes occuring,

and whenever I saw a thunderstorm or change of weather, I made note of them. Then I would go down to Dr. Penrod, and we would compare notes, I kept that up for three or four months, and Dr. Penrod said, "This is an honest fact, you can do what we can not do, but you do it by a sort of natural instinct and not by any scientific methods." Then I told him what I thought about the weather, and the changes observable.

He was a very jovial and agreeable man, and he threw himself back into his chair, and laughed as though he would split and he said, "There is nothing known to science, by which we can foresee the thunderstorms 150 miles distant; and if there were any methods by which such things could be done, the scientific men would have found it out long ago. But they have not found it out, nor have you either."

He further said, "Now, here is a work by Prof. Loomis, that illustrates the principles on which we base our system, and all scientific men base their calculations on this system. You take this book and read it carefully, and then you will find out your mistake."

I took the book and read it carefully from "a" to "z" and I very soon discovered that Prof. Loomis had placed, to quote the old proverb, "The cart before the horse." Everything was upside down, the more any person studied that book, the less they would know about forecasting the weather; for Prof. Loomis asserts that the storms are caused by a warm current of air ascending into a colder current at a high altitude. A cold current not being able to hold the amount of moisture that was contained in the warm current, produced rain. But I have noticed that when we were going to have thunder showers the clouds always floated lower than usual, and that just as soon as the cumulus cloud assumed smooth gray surfaces, that it would rain, independently of any current, and also because

thunder showers frequently form when there is a dead calm.

It makes no difference whether a current of air ascends into the cold region or whether a current of air descends into a warm region, the principal is the same. But if scientists were correct, that storms are formed by a warm current of air ascending to a higher altitude, the storm would be located at a higher altitude. Observation shows the reverse of that to be true, for whenever there is a storm, the colder atmosphere comes nearer to the earth's surface. Therefore, I contend the theories which I set forth twenty years ago have been abundantly substantiated as correct; and the following article, which was published in Pearson's Weekly in July, 1903, fully explains my statement.

That article was entitled, "Holes in the Air," and described invisable pitfialls with which airships may have to contend. Then the author goes on to explain what effect these holes in the air have. You will notice that he calls them "holes," while I call them openings, in an article which I wrote forty years ago.

The ideas which we try to convey are the same. Let us call them "holes in the air," for argument's sake. Now suppose we could place a barometer in one of these holes in the air, what would the mercury do? Why! it would go down as though the bottom was knocked out of the tube in which it had been placed.

What I want to show is that these "holes" in the atmosphere are the starting points around which storms form. I have seen this for more than forty years, yet my statements were ridiculed because not confirmed from a scientific point of view, as I was first to discover the law, I am also the first to apply that law, and thus ascertain in advance what the weather will be.

In the year 1881, in February, I took a trip to Washington, in order to have a talk with the head of the Weather Bureau, General Hazen. He received me very pleasantly and listened to every word I had to say very attentively, and among the things I told him was this: "General, if you had 10,000 men and a station on every high mountain in the country, and used your present system, you would not be able to forecast the weather any more accurately than today; it is the fault of your system and not of the men."

He simply said, "mm!"

But results are justifying the application of my system.

The great difference between my system of forecasting the weather and that of the government is this: The government experts start out with the assertion that changes in the weather are of two kinds, 1—regular or periodic; 2—irregular or accidental. The regular changes are those which occur gradually, as the seasons change; the accidental are those which come suddenly. The latter, they claim, cannot be foreseen nor explained

My readers may remember that one of the "accidental" changes come suddenly, April 27, 1897, the day of the dedication of Grant's monument in New York. Forty-eight hours previous to the 27th, the Weather Bureau, after carefully examining the reports of the weather from all sections of the country, told the public there was no storm in sight, and the indications were that there would be exceptionally fine weather on the 27th.

But on the afternoon of the 26th an accidental storm formed suddenly over Northern New York, which caused a howling northwest gale on the 27th, with a drop in the thermometer of 40 degrees, completely upsetting the government bureau's calculations.

I claim no accident can happen in the operation of God's laws. Every storm that ever formed was obedient to some law and controlled by it. It would be a very serious matter to have "accidental" storms prowling around loose and nobody responsible for them.

That fall in the temperature on April 27th, I saw coming, and on April 9th I wrote to the Hon. Mr. Stewart, our Congressman, at Paterson, warning him to wear an overcoat, and right well did he appreciate it. The men from Washington suffered greatly from the cold that day.

I claim there is one law which controls the weather throughout the world, and I can explain that law so that a person can forecast the weather for his locality weeks in advance, without the aid of scientific instruments. If we know the law we will also know what effect the change in the temperature will have upon these instruments long before the instruments register the change. An instance when the Weather Bureau at Washington were not able to apply their theory correctly, occurred on the 4th of March, 1897, when President McKinley, was inaugurated. Forty-eight hours before, they promised warm southerly breezes and balmy atmosphere, but an accidental storm formed suddenly and caused a howling northeast storm to descend on Washington that day.

STUDYING THE CLOUDS

As I look back to my boyhood days, the most enjoyable hours of my life were those spent in watching and studying the clouds, and the great regrets that I experienced as I approached manhood were, that when I became a man I could no longer enjoy watching the formation and progress of thunder storms; for I then considered it beneath the serious

consideration of men. But when I became a man I found that every branch of business was more or less affected by the general condition of the weather. I learned that it was worth thousands of dollars to a single county in any state to know in advance what the general weather would be for a coming season, i.e., whether it would be wet or dry, hot or cool. I learned that the weather not only controlled the markets for the agricultural products of the world; but it also regulated the price of every other product both on land and sea. For instance, some years the oyster catch would be small and very inferior in quality; while another year it would be large and well flavored. I soon discovered that this condition of the oyster market was regulated by the condition of the weather, for whenever we had a mild, dry summer with no easterly gales along our Atlantic coast, then the oysters were undisturbed, they simply laid still and grew fat; the result was a bountiful yield. But if severe easterly gales swept along our Atlantic coast during June and July, then the oyster beds were covered with sand so deep, that the oysters were compelled to exert themselves; if they laid still they would smother. The exertion of working their way to the surface made the oysters thin and unpalatable. So I learned that even the edible products of the sea are regulated by the weather which prevails above them. Recently Mr. Willis Moore, Chief of the Weather Bureau, in an article to the public press, said, "If we could foresee what weather would bring during a coming season, it would save millions of dollars to the agricultural interests alone." Therefore, any one can readily see, that if I place in their hands a book giving an outline of my system, showing how one may determine for himself, no matter where he may live, what the general weather will be for several days in advance, that this information will prove to

be of great benefit financially, no matter what line of business one may be engaged in.

In view therefore, of the general benefits that I am now, after years of investigation, convinced will ensue to the general public in all the various activities of our modern life, I have resolved to place the general outlines of my system in the hands of the people of this great republic. In doing so all that I ask is a patient consideration of the principles laid down, and an equally patient application of them to the meterological conditions of various localities.

Further, I ask, that in case of any mistake in the working out of my system by those who may examine it and seek to apply it, that they will remember that in this as in all other professions, "Practice Makes Perfect." Bear in mind, also, an older rule, that I have followed amid all the perplexing experiences that come to the seeker after knowledge in any sphere of applied science, viz., "If at first you don't succeed, try again."

With these prefactory words, the writer proceeds to set forth as lucidly as he may and without the use of embarrassing technical terms, the outlines of what he believes to be the sanest method of forecasting the weather of which, up to this time, knowledge is to be had.

CLOUDS AND THEIR SIGNIFICANCE

(With Illustrations)

There are four forms of clouds, namely, cumulous, cumulo-strattus, nimbus and cirrus. Whatever clouds appear in the heavens belong to one of these four classes. There is only one form of cloud created; that is the cumulous, a light bunch of mist. The other three clouds are a mere matter of growth. The cumulous cloud is formed, and when the atmospheric conditions are favorable then this little cumulous cloud becomes enlarged, both in thickness

and in width, and if the conditions continue favorable to its growth, then it becomes a cumulo-strattus cloud, and the two forms of clouds appear one above the other. When the conditions are favorable then the cumulo-strattus cloud is formed into a nimbus and drops of rain start to fall, the cloud changes its form, all its roughness disappears and all uneveness and it becomes a perfectly smooth form.

Winter and Summer and in any month in the year, the cloud takes that peculiar form. After the rain has been falling and this nimbus cloud has parted with its moisture, then it becomes a cirrus cloud.

Boston, Mass. October 28, 1903.

Prof. A. J. De Voe, Hackensack, N. J.:

Dear Prof. De Voe:—I was glad to note that your prediction of a thunderstorm for the nineteenth of this month was verified, as well as the first snowstorm of this season for the 26th. The latter I had mentioned to several friends, a day or two before it came, and got hooted at for my pains. I was on the North Shore of Massachusetts, when the thunderstorm came along. It occurred between 1 and 2 o'clock Saturday, the 19th. I had forgotten all about your prediction, else I might not have got caught in it and got the "ducking" I did, when on my way to the Ipswich Sandhills for a little shooting. I was going "ducking," to be sure; but I got about all I wanted on the road.

This is written spontaneously, in order that I may pay my tribute to your sagacity, as I learn that the storm did not occur in this vicinity with the force that it did in Massachusetts. While it lasted it was very severe, and was accompanied, as I have said, by terrific peals of thunder.

I do not know what the "regular" predictions for that day were, as in common with many others, I

pay no attention to them; but I dare say they made no reference to a storm of the character you prophesied, and which came along on "schedule time," as I can testify, and do, with pleasure, herewith.

Very truly yours,

FREDERICK A. OBER.

When we bear in mind that every cloud that appears in the heavens is one of these four forms of clouds, we can tell instantly what is taking place, and when we see very thin strips of light cirrus cloud, they indicate that below the horizon, far beyond the reach of our vision, there has been a cumulous, a cumulo-strattus, and a nimbus cloud and that rain has fallen that day two hundred miles away, beyond the line of our vision, in the direction from which the cirrus cloud is approaching; it may be in the south, or in the west, or north.

The cirrus cloud is simply a sheet of frozen fine needles of ice, gradually evaporating and disappearing.

The cloud from which rain falls seldom travels further than twenty miles, but it is constantly changing its form, so that instant that the cloud appears above the horizon, we can tell whether that cloud is growing or whether it has parted with its rain fall and is evaporating; the same as we look upon our trees and see green leaves, but we know that early in the Spring the leaves were buds, and those buds developed into leaves and later on came the fruit; if the trees were fruit trees.

The leaves and fruit are not created as leaves and fruit on the trees, but they grow; and the clouds grow in just the same way.

Rain never falls from the cloud until the cloud has passed through three changes and the instant it passes through these three forms it then takes the fourth form of the cirrus cloud.

When light cirrus clouds appear along the northeastern horizon, extending from a point in the north to east, they indicate that a storm or low barometer is located over Canada east, and also that it is moving southward, if these clouds appear in this position during the winter months they indicate that pleasant weather will prevail for two days, followed by fogs and a thaw on the third day. When they appear in other months of the year, you may expect three days of pleasant, dry weather, followed by a hot wave.

When we see these clouds moving across the sky, if they are going from the northwest we know that more than 100 miles in the northwest it has been raining or is raining at the present time, and if those clouds advance rapidly from the northwest, it does not matter how the wind is blowing on the surface of the earth where we are, but 200 miles northwest of us the wind is blowing from the southeast.

Why? Because cirrus clouds move outward from the storm center in a large circle, while the wind blows in toward the storm center, whirling from right to left, directly opposite from the way the clouds move, so if it is in the Summer time, and we see these light cirrus clouds moving rapidly from the northwest, we can just write down this: Tomorrow, easterly winds; hot sultry weather, followed by thunder showers.

When we see these clouds advancing rapidly from the southwest, bearing in mind that they always move in the large circle outward from the storm center, we may know that the storm is forming south of us and tomorrow we will have falling temperature and northerly winds.

When light cirrus clouds appear along the northwestern horizon, extending from a point in the west and moving from the southwest toward the northeast, they indicate that a storm or low barometer

is located over the Gulf States, moving eastward. If these clouds appear in this position during the Winter months, they indicate squally weather, followed by cold wave.

When light cirrus clouds appear along the southwestern horizon, extending from the west to the south, and moving in a southeasterly direction, they indicate that a storm or low barometer is located over the Missouri Valley, and that it is moving southeasterward. When these clouds appear in this position during the Winter months, they indicate an approaching storm. Snow or rain may be expected on the following day, with a rising temperature. When these clouds appear in a similar position during other months of the year they invariably indicate muggy, sultry weather, followed by rain and thunder showers.

When light cirrus clouds appear along the southeastern horizon, extending from the southwest to the northeast, they indicate that a storm or low barometer is located over the South Atlantic States, and that it is moving northward. If these clouds drift eastward you may look for a blizzard within forty-eight hours, during the Winter months. They always indicate an approaching storm along the Atlantic Coast, and the wind will invariably blow from the northeast, followed by a cold wave any month in the year.

STUDYING THE WEATHER

1. We all know that one of the main topics of daily life is the weather.
   What do we mean by weather?
   The condition of the atmosphere for any particular day is the weather for that day.
2. One of the great factors in human progress is climate.
   What is meant when we speak of climate?

The average weather conditions for the year in any place is the climate for that locality.

3. What factors are considered when we speak of weather?

When we speak of weather we take into consideration rainfall, temperature, humidity, atmospheric pressure and sunshine.

4. How is the amount of rainfall measured?

Rainfall is measured by an instrument called a rain gauge. This gauge collects the water which falls within a measured area. In this way the amount of rainfall is easily determined. The amount of rainfall is expressed in inches. The amount of rainfall differs every year even in the same locality. On the amount of rainfall most of human happiness and prosperity depends.

5. How is temperature measured?

Temperature is measured by a metallic thermometer which records the readings on a moving cylinder of paper. In this way records of annual rainfall are kept.

6. How is humidity measured?

Humidity is measured by the Dew Point apparatus, or by means of a wetbulb theometer. Humidity is a great factor in comfort during the summer months.

7. How is sunshine measured?

There is an instrument known as the Sunshine Recorder, which absorbs enough heat from the sunshine to close an electric circuit by means of expanding mercury. In this way the duration of sunshine is recorded by electricity. If one wishes to get more than a person's opinion of the weather for any locality, he can get the records of all these different factors for himself and thus form an accurate judgment of the weather in any given place.

8. What relation does atmospheric pressure bear to weather?

It has been found by experience that a "falling barometer" showing a sudden decrease in atmospheric pressure precedes a storm; and a "rising barometer" that is, an increasing atmospheric pressure indicates the approach of fair weather, while a steady "high barometer" means settled fair weather.

The United States Weather Bureau takes every day at the same time (8 A. M. Washington time) readings of the barometer and telegraphs the results to a central station where weather maps are prepared. On the maps there are certain broad areas where the pressure is "low" and other sections where the pressure is "high."

9. What do low pressure areas show?

Low pressure areas are usually storm centers, which move in a general easterly direction at the rate of several hundred miles a day. In this way the patch of the storm is predicted.

10. What do high pressure areas indicate?

The high pressure areas occupy the spaces between the lows and also move eastward across the continent, but their course is usually inclined toward the southeast. The high pressure areas are not as regular as the lows. In the region of high pressure we will find fair weather.

STUDYING THE ATMOSPHERE

1. What is wind?

Wind is air in motion.

2. What starts air in motion?

There are three causes which start the air in motion:

First—The law of heat.
Second—The law of cold.
Third—The law of condensation of moisture in atmosphere.

3. How does the law of heat produce wind?

By expanding the atmosphere and causing it to flow outward and upward.

4. How does the law of cold produce wind?

By contracting and shrinking the atmosphere at a given point, causing the surrounding atmosphere to flow inward and downward.

5. How does the law of condensation of moisture produce wind?

The minute particles of moisture which float in our atmosphere are drawn by the law of attraction towards the coldest point, and when the temperature of the atmosphere sinks below the freezing point, then the aqueous vapors congeal and fall to our earth, forming the hoar frost; or they are arrested in their downward flight by the formation of a cloud. Whatever leaves our atmosphere and descends to our earth creates a vacuum just in proportion to the weight of that which leaves the atmosphere. Therefore, when tons of water are falling in the form of rain over a given point, then gales of wind are set in motion, whirling around that point where the heaviest rain is falling. Wind is a servant, not a creator, and it simply rotates around that point where the heaviest rain is falling; and the point of heaviest rainfall may travel northward, or southward, or eastward, and the winds follow it. Therefore, if we know in advance where the heaviest rains will fall we will also know from what direction the winds will blow on a given day, months in advance. The name of clouds is given to collections of vapor that float above our earth at various heights.

6. How many kinds of clouds are there?

Four.

7. What are they called?

Cumulus, cumulo-stratus, nimbus and cirrus.

8. How many of these are created?

Only one, the cumulus.

The Thunder Storm Growing

9. What do the other forms of clouds indicate?

The other forms of clouds simply indicate cloud growth, and show the different stages of progress which the cumulus cloud has passed through.

10. How many transformations must a cumulus cloud pass through before it can rain?

All cumulus clouds must pass through three transformations before it can rain. The sky may be obscurred by heavy cumulus clouds all day and not a drop of rain fall, because the cumulus clouds have remained as cumulus or cumulo-stratus clouds.

11. What causes the cumulus cloud to pass through these different transformations?

The cumulus cloud is composed of minute particles of moisture like soap bubbles. These minute particles are warmer than the surrounding atmosphere, and when millions of these are collected they exert a lifting power which presses the upper side of the cloud into a region of freezing temperature, and the particles of moisture can no longer remain as moisture but begin to congeal into fine particles of frozen sleet and we know by observation that the cumulus cloud is changing into a cumulo-stratus cloud, because the rough edges become smooth and the uneven places become level presenting the appearance of a smooth gray sheet. Then we know it has become a nimbus cloud. That nimbus cloud can be distinctly seen whenever there is a thunder storm in progress in any direction within one hundred and seventy-five miles distant provided there is a clear atmosphere between you and that storm.

READING THE CLOUDS

To know the construction of clouds and what they indicate is of great value in forecasting the

coming weather. Why?

Because, as soon as a storm has formed over any part of the world, cirrus clouds will shoot out from that storm center in every direction. All forms of clouds have two movements, they have a forward movement also a drifting movement. For instance: When a steamboat leaves the slip to cross the Hudson River the captain does not steer straight across because he knows he must allow for the force of the tide. And if the tide is running south he points his steamer two thirds up the stream, while if the tide is running north he points his steamer southward. Exactly the same principle operates on every storm that is formed. If the attractive force of the moon is drawing that storm northward, then that storm will drift northward no matter where the storm may have been created. It is this drifting motion of storms which has fooled Meterologists of all ages. Therefore, I claim that the cirrus clouds are of far more value in showing us in what direction the approaching storm is drifting than the barometer.

For instance, we arise on a clear cold winter's morning and we see thin cirrus clouds moving down from the northwest pointing southeastward. If they continue that movement all day we can safely say tomorrow southerly winds and warmer weather, and we can continue to make that same forecast, just so long as those clouds continue to move in that way. But as soon as those cirrus clouds change their course and point to the northeast, then that storm center is either dying out or it is going to travel northeast. Then we can predict for tomorrow rain turning to snow followed by clear and colder weather.

Again, when we see a thin bank of cirrus clouds across the southern horizon and drifting southward and finally disappearing below the horizon, then we can predict pleasant weather for several days,

The Beginning of a Thunder Storm

but if that bank of cirrus clouds drifts slowly northward then we can safely predict for tomorrow northeast winds and colder weather followed by a snow storm, and if it is at new moon prepare for a blizzard.

When a thunder storm cloud begins to part with its rain that cloud only travels about twenty-five miles then a new cloud forms directly in front of that cloud and that process is kept up just as long as that thunderstorm belt continues to scatter its rain.

I received my first important lesson on the movements of thunder storm belts on the 21st of June in 1859. It was Friday and we were picking strawberries for market. At noon it began to thunder in the southwest and the clouds increased in blackness as they approached the vicinity of New York City. We had just an ordinary shower at Hackensack, but at New York City hail fell as large as teacups and destroyed millions of dollars worth of property. Among the buildings destroyed was the Crystal Palace, which was made of glass. It became a total wreck. At that time my father was a subscriber for the New York Herald and the stage coach delivered it every evening. Each evening my father read this paper aloud and we children learned a great deal of useful information from these readings. The most important thing that I learned the next day was the comments about that great storm. The Herald stated that it raged at Boston and New York and Philadelphia at the same hour, 2 P. M. I at once jumped to the conclusion that there was more than one storm and I soon became able to locate thunder storms more than 200 miles distant by using this device. I said thunder storms are located in a storm belt and that thunder storm belt extends in a northeast and southwest direction for a thousand miles, then all those thunder storms drift southeastward and each city gets one. As that long narrow strip passes, places one thousand miles

apart may get that shower at the same hour they get the belt but not the same shower.

SIGNS FOR WEATHER SHARPS

What is the first important sign that an important storm is approaching?

In winter the most important sign is a heavy white frost, while in summer the most important sign is a dense fog.

Why?

Because all changes in our weather have their origin miles above our earth.

Can we give an example?

Yes. The winter of 1865 was extremely cold and stormy. On January 25th we were cutting down trees and hauling the logs out on high ground. The air was perfectly still, but the mercury was several degrees below zero, and all day long we heard the trees snap like pistol shots, because the sap froze so rapidly that the trees expanded and burst the bark, and every time the bark split there was an explosion. I do not know just how low the thermometer was, but I know this, I always carried a folding rubber cup in my pocket; we cut a hole in the ice on the Hackensack River, then we drank from that rubber cup and before we could finish our drink, the outside of that cup was coated over with ice. The next morning the thermometer stood 26 degrees below zero with a thick fog. Every tree and bush was coated over with hoar frost half an inch thick. Professor Loomis in his book on the weather tells us that when the temperature of the atmosphere falls below the freezing point, then the aqueuous vapors floating in our atmosphere congeals and settles on substances colder than the atmosphere. This we call hoar frost. As I looked around me that morning and beheld that wonderful display of hoar frost, I said, "Professor Loomis, your theories do not explain this beautiful display

Thunder Storm in Progress

this morning. How could any aqueous vapors be floating in our atmosphere this morning, and land on the top of our highest trees, when the ground is covered with several feet of snow and every pond and stream is covered with many inches of solid ice? No, there must be a warm stratum of air loaded with moisture miles above our earth and as that warm current settles towards our earth, that moisture congeals into very fine snow coming down from a perfectly clear sky.

When my men came to work that morning, I said, "Men, we must get right up to the woods and haul out the balance of those logs which we left yesterday, because it is going to rain and those logs will get fast in the ice in less than 48 hours." The men simply said "Phew!" and we went to work. On the way to the woods every man we met asked, "What are you going to the woods for such a morning as this?" I replied, "We must haul out logs today because it will rain tomorrow," and everybody laughed. But the next day there was a pouring rain all day, then it cleared off like the snap of a whip and everything froze up solid.

In February 1888 I noticed by the papers that very heavy rains were falling over the New England States and I knew that heavy rains in February mean heavy snow in March. Then I said to my men, "I want you to cut down and haul out logs just as fast as you can because we will have very heavy snows in March and then you won't be able to haul logs, and I hired three extra teams. So when that blizzard came on the 13th of March 1888 I had enough logs and cordwood to last me three months. It pays to know something about the weather when you are in business no matter what the nature of your business may be.

ANSWERING SOME QUESTIONS

1. What is one of the startling effects of a descending storm?

The Aurora Borealis, or northern lights.

2. How does the forming of a storm produce Northern Lights?

A forming storm produces rapid currents of wind: rapidly moving currents of wind produce friction, friction produces electricity; electricity illuminates the moisture in our atmosphere, then we behold the Northern Lights in all their glory. The moisture is blown by currents of wind and illuminated by electricity. The Northern Lights are not confined to the Arctic regions, but they appear wherever a sudden storm forms. They are sometimes seen in the Gulf States when they are not visible in the Northern States.

3. What kind of weather usually follows a display of Northern Lights in the United States when they occur during the summer or fall months?

They are usually followed by southerly winds and hot weather for several days.

4. Why?

Because the storm is over the northern part of the United States.

5. Why cannot we see the Northern Lights, when a storm is forming south of the locality where we live?

Because the thickest moisture is on the southern side of a forming storm.

6. What is the first noticeable effect that a storm is forming north and west of us in winter?

The first noticeable effect is a hoar frost.

7. What is a hoar frost?

When the temperature of the atmosphere drops below the freezing point, then the aqueous vapors which float in our atmosphere congeal and settle to our earth as fine particles of snow.

8. When the mercury stands below zero and all rivers and bodies of water are frozen over, where does the hoar frost descend from?

There must be a warm current of air loaded with moisture drifting over our earth, the aqueous vapors in this warm current descend to our earth and congeal into fine snow on their descent to our earth.

9. What happens then?

A storm forms and heavy rains descend. Such an incident happened in northern New Jersey the latter part of January 1875. The mercury stood 26 below Zero. Every shrub and bush was covered with half an inch of hoar frost, and in less than twenty-four hours we had a pouring rain. Then it cleared off suddenly and the cold returned.

10. Why do we have rain in the midst of winter weather?

Because in winter all precipitation leaves the clouds as snow. But at times when the storm center is far to the north a warm current of wind is blowing from the south between our earth and that cloud, then the snow is melted and descends to our earth as rain. But when the temperature near our earth drops below freezing, then the rain drops change to hail.

11. Why do we at times have rain and hail out of the same storm cloud?

Because near the storm center the snow and rain are very close together, while further south it is all rain and to the north it is all snow.

12. When a severe storm forms far to the north of us in winter, what are the various effects that storm will exert over our atmosphere here?

First, hoar frost. Second, southerly winds. Third, rising temperature. Fourth, rain. Fifth, southeast gales.

13. By carefully watching the clouds in their different stages of progress and the effect produced by an approaching storm, how far in advance can we predict changes in our weather?

Three days.

How many days usually elapse before a similar storm will again occur?

Seven days.

14. How many different kinds of storms are we likely to encounter during a whole year?

Four kinds classified as follows:

First, cloud bursts, second, tornadoes, third, electrical storms, fourth, cyclones.

15. What is a cloud burst?

It is the sudden formation of a dense cloud close to the earth, which appears to carry a small lake on its top. When this dense cloud strikes a high hill or mountain the jar breaks the cloud, then the water from that small lake rushes down the southern side of that hill or mountain. Many people have been drowned by this sudden rush of water.

16. What causes a tornado?

There is an invisible ceiling to our atmosphere. At times this ceiling breaks then there is a mighty rush of cold wind rushing downward towards our earth. Fifty years ago men called them Pit-falls. Thirty years ago I described them as holes in the sky. Fifteen years ago aviators described them as pockets in our atmosphere. I still claim that holes is the best word. As soon as this downward rushing current enters our atmosphere clouds instantly form. If these clouds do not form fast enough to check that descending current in advance of a thunder storm then tornadoes will form on the southeast quadrant of that approaching thunder storm.

17. How much space does a tornado usually cover?

About half a mile wide and from five to ten miles long.

18. What is the safest thing to do when we see a tornado approaching?

We should throw open the windows on the top floor of our house opposite to the tornado.

19. Why?

Because the temperature under a tornado is much colder than the air in our house. It is the hot air inside which lifts the roof off the house.

20. What kind of a storm will follow a tornado?

Violent electrical storms and heavy rains.

21. What produces a cyclone?

It is two or more storms united in one great storm center which moves by the law of attraction and sometimes covers a path of two thousand miles long.

FORECASTING WEATHER YEARS AHEAD

Dry seasons, or excessive wet seasons can be determined hundreds of years in advance, by knowing where the paths of the total eclipses of the Sun will pass on a given month and day. As I told our Government officials last September when the Special Commission was sent down to Mexico to take photographic plates of the sun during the eclipse, Sept. 10, 1923. That Commission applied for a ten thousand dollar insurance policy that in case of rain they could recover damages, and they requested our government to pay a premium of five hundred dollars. I simply asked the question, Why should our government pay five hundred dollars on a rain insurance policy when they were going into a section of country at a time when it could not rain? Somebody lost that five hundred dollars because they would not believe my statement.

I can distinctly remember just how certain storms looked both winter and summer before I was ten years old. Simply because they were unusual in their appearance. A snow storm began on a Saturday, February, 1855, and the peculiar thing about it was this, it began to snow when there were no clouds in the sky. It began as fine frozen sleet, the

sun was shining and there was no wind and the sun gradually disappeared because it snowed so fast, and at midnight there was six inches of snow on the ground, then we had a sudden shower and it cleared off almost as warm as July. At sunrise on Sunday morning there was not a speck of snow to be seen nor a cloud in the sky while there was no wind at any time.

The daily papers of December 12, 1923, published three startling statements regarding weather conditions. These conditions were seen on the Government weather map of December 11, 1923. First: there was freezing weather out in California; where most people think there is summer weather all the year around. Second, there was a great snow storm down in Texas. Snowing like a regular blizzard for the past twelve hours. Third, there was a depression of marked intensity centered over Saskatchewan, Canada, traveling rapidly southeastward. These three statements form a wonderful combination which cannot be explained by any method known to science. But the fact that I accurately described those conditions more than two years in advance (and they were published in the Chattanooga Wall Calendar for this December) proves that I must know the law or I could not describe the conditions that would follow the operations of that law.

I have been hampered in my work for many years because I could not get certain astronomical calculations which I must have in order to ascertain what sort of weather follows those conditions when they were repeated fifteen or twenty years in the future. Not until the past summer did I find a man who was both willing and able to give the important information which I needed. For instance, I have heard my mother speak hundreds of times about a great storm which occurred during the month of June 1841. A Mr. Chris Zabriskie

who lived near New Bridge, N. J., a few miles north of Hackensack, a farmer, stated that he had a regular sized flour barrel standing in his open field where nothing could run into, and he stated when that storm was over that flour barrel was running over with water from the rain which descended during forty-eight hours. There were no rain measuring instruments in New York City at that time, but a flour barrel is about 40 inches deep.

I wrote to an astronomer to ascertain the day and hour and latitude of the New Moon during June 1841, and he stated that it occurred on the 19th. Then I wrote inquiring the date of the New Moon in June 1859 and he stated that it occurred on the 31st and the moon was in the same latitude as in 1841. That storm formed at 11 o'clock in the morning and hail stones as large as tea cups fell in New York and caused over a million dollars of damage by destroying glass. A pouring rain continued for 48 hours after that thunder storm and destroyed millions of dollars worth of property by carrying away bridges. The next great thunder storm occurred at the new moon the 28th of May, 1889. That was the storm which caused the destruction of Johnstown called the Johnstown Flood and it continued for three days. The next great thunder storm occurred on the 10th of October, 1905. It began like all the others with a thunder storm. It continued for three days and more than ten inches of water fell, and New Jersey had to pay hundreds of thousands of dollars to rebuild her bridges. I could go on for hours and recite interesting instances where great loss of life and property could have been prevented had we known and heeded that law and prepared to meet the danger.

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